Time Trends of Persistent Organic Pollutants and Heavy Metals in Umbilical Cord Blood of Inuit Infants Born in Nunavik (Québec, Canada) between 1994 and 2001

Frédéric Dallaire, Éric Dewailly, Gina Muckle, and Pierre Ayotte

Public Health Research Unit, Laval University Medical Center (CHUL–CHUQ), and Laval University, Québec City, Québec, Canada

Inuit inhabitants of Nunavik (northern Québec, Canada) consume great quantities of marine food and are therefore exposed to high doses of food chain contaminants. In this study, we report the time trends of persistent organic pollutants, mercury, and lead in umbilical cord blood of infants from three communities of the east coast of Hudson Bay in Nunavik. We analyzed 251 cord blood samples collected from 1994 through 2001 for polychlorinated biphenyls (PCBs), dichlorodiphenyl trichloroethane (DDT), dichlorodiphenyl dichloroethylene (DDE), hexachlorobenzene (HCB), chlordanes, lead, and mercury. Using an exponential model, we found strongly significant decreasing trends for PCBs (7.9% per year, $p < 0.001$), DDE (9.1% per year, $p < 0.001$), DDT (8.2% per year, $p < 0.001$), and HCB (6.6% per year, $p < 0.01$). No significant trends were detected for chlordanes. A significant reduction of lead and mercury concentrations was found, but there was no clear linear or exponential trend. The decreases observed could be explained by a decrease in food contamination, by changes in dietary habits, or, most likely, by a combination of both. *Key words:* **aboriginal, chlorinated pesticides, diet, environmental exposure, food contamination, heavy metals, human, lead, mercury, newborn, polychlorinated biphenyls, time trend, umbilical cord blood.** *Environ Health Perspect* **111:1660–1664 (2003). doi:10.1289/ehp.6269 available via** *http://dx.doi.org/* **[Online 2 July 2003]**

Lipophilic organochlorines (OCs) that resist biodegradation can accumulate in the environment to become persistent organic pollutants (POPs). Among them, polychlorinated biphenyls (PCBs) and several chlorinated pesticides have been detected in tissues of animals and human throughout the world. Their capacity to accumulate in adipose tissue leads to biomagnification in the food chain, and their concentrations reach highest levels in top predator species (Braune et al. 1999; Muir et al. 1999). Mercury and lead are ubiquitous in the environment. They both occur naturally, but human activity has increased their mobilization and distribution in the environment. Mercury is excreted slowly by animals and plants and also accumulates in the food chain (found mostly as methylmercury, its organic form).

Most studies focusing on temporal trends of POPs have identified a decreasing trend during the last decades. Since the mid-1970s, levels of dichlorodiphenyl trichlorethane (DDT) and PCBs have decreased in tissues of freshwater fishes and herring gull eggs in Canada and the United States (Hebert et al. 1994; Ryckman et al. 1994; Schmitt et al. 1999). In Arctic wildlife, POP concentrations seem on the decline for most species (Muir and Norstrom 2000; Muir et al. 1999) but not all (Muir et al. 2000). In environmentally exposed humans, levels of PCBs in breast milk have dropped in the last 15 years in Germany (Schade and Heinzow 1998) and Sweden (Noren 1993; Noren and Meironyte 2000). Downward trends in human fluids have also been observed in the United States (Michigan; He et al. 2001), Mexico (Waliszewski et al. 1998), Canada (Dallaire et al. 2002), and the United Kingdom (Harris et al. 1999).

For cultural and economic reasons, carnivorous fish and marine mammals constitute an important part of the diet of the Inuit population living in Nunavik (northern Québec, Canada). Their exposure to such biomagnified substances as OCs and heavy metals is thus proportionally high. Several studies have identified markedly higher mean concentrations of POPs and heavy metals in adult blood, cord blood, and breast milk of Nunavik inhabitants compared with those of the southern population of the province of Québec (Ayotte et al. 1997; Dewailly et al. 1989, 1993, 1998; Muckle et al. 1998; Rhainds et al. 1999). In this context, we report here the temporal variations of POPs, mercury, and lead in umbilical cord blood of infants born from 1994 through 2001 in three communities of the coast of the Hudson Bay in Nunavik.

Materials and Methods

Population and recruitment. The targeted participants were pregnant Inuit women living in three communities (Puvirnituq, Inukjuaq, and Kuujjuaraapik) on the east coast of Hudson Bay in Nunavik (Figure 1). For the present analysis, we included the participants of two previous studies done on the same population. The first study was designed to monitor the prenatal exposure to environmental contaminants and took place between November 1993 and December 1996 (Dewailly et al. 1998). Pregnant Inuit women were invited to participate on arrival at the health center for delivery. Of the 491 women who accepted the invitation to participate, only the women living in the three targeted communities (Puvirnituq, Inukjuaq, or Kuujjuaraapik) were included in the present analysis ($n = 138$). We excluded women living in other communities because we had a significant number of samples only for 3 years for these communities, and we believed that the interference caused by annual variations would have been too great for the estimation of valid time trends.

The second study was designed to evaluate the impact of environmental exposure to POPs and heavy metals on infant health and development (Muckle et al. 2001). It was conducted between November 1995 and March 2002 in the three communities mentioned above. In this study, pregnant women were approached by one of our research assistants after their first prenatal medical visit. Three hundred fifty-eight eligible pregnant women were approached, and 248 (69.3%) accepted the invitation to participate. Because of staff shortage during deliveries, only 113 cord blood samples were available when statistical analyses were done. The participants for whom the cord blood samples were unavailable were similar to the other participants regarding gestational age, parity, maternal age, and infant sex. However, they had slightly lower maternal blood mean concentration of OCs. The 113 participants for whom cord

Address correspondence to É. Dewailly, Public Health Research Unit, 945 Wolfe Avenue, 2nd Floor, Sainte-Foy (Québec), G1V 5B3 Canada. Telephone: (418) 650-5115 ext 5240. Fax: (418) 654-3132. E-mail: eric.dewailly@crchul.ulaval.ca

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The authors declare they have no conflict of interest.

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